

In the foregoing description, example embodiments have been described, in which functionality for determining an optimum order to read records from a linear data storage medium is provided by way of an program operating in a host computer device.

However, alternative embodiments are possible in which functionality for determining an optimum read sequence of records from a data storage medium is provided within a tape drive unit itself, in which case the tape drive unit receives from the host computer a list of data records to be retrieved, and the tape drive unit itself determines an order in which to retrieve data records from a linear data storage medium by reading data stored on a cartridge memory.

The functionality may be provided in the data storage unit by a program operating a processor within that data storage unit, or by firmware operating programs and methods as described herein for data retrieval.

## **Claims**

What is claimed is:

1. A method of locating a plurality of data records stored linearly on a data storage medium and determining an order in which to read said plurality of data records, said method comprising:

reading data relating to said plurality of data records stored on said data storage medium from a memory device associated with said data storage medium;

determining a position of said data record on said data storage medium for each data record to be read; and

determining an order in which to read said plurality of data records from said data storage medium to minimize time required to read said plurality of data records.

2. The method as claimed in claim 1, wherein determining a position of each data record comprises:

determining a location of said data record in a direction transverse to a read direction along said data storage medium; and

determining a location of said data record along a length of a line along which said data record is written.

3. The method as claimed in claim 1, wherein determining a position of each data record comprises:

determining a location of said data record in a direction transverse to a read direction along said data storage medium; and

determining a location of said data record along a length of a line along which said data record is written;

wherein said line along which said data record is written comprises a line between a beginning of said data storage medium and an end of said data storage medium.

4. The method as claimed in claim 1, wherein determining an order in which to read said plurality of data records comprises:

identifying a set of said data records which can be read in a first direction of said data storage medium relative to a read head; and

identifying a set of said data records that can be read in a second direction of said data storage medium relative to said read head.

5. A program storage device, readable by a machine, tangibly embodying a program to perform a method for controlling a computer to retrieve data from a data storage medium, said method comprising:

receiving data relating to a plurality of data records stored on a data storage medium from a memory device associated with said data storage medium; and

determining positions on said data storage medium of said plurality of data records using the received data; and

determining a read sequence for reading said plurality of data records from said data storage medium to minimize time needed to read said plurality of data records.

6. The program storage device as claimed in claim 5, wherein determining a read sequence to control a data storage drive unit for moving a data storage medium past a read head comprises:

reading a plurality of records recorded on said data storage medium in a first direction, in an order in which they are presented to the read head while the data storage medium is traveling in said first direction relative to said read head; and

reading a second plurality of data records in an order in which they are presented to said read head, as said data storage medium passes said read head in a second direction relative to said read head, said second direction being opposite to said first direction.

7. A computer adapted to communicate with a data storage device to enable reading and writing a plurality of data records on a data storage medium, said computer comprising:

a component adapted to receive data relating to a plurality of data records stored on a data storage medium from a memory device associated with said data storage medium;

a component adapted to determine positions on said data storage medium of said plurality of data records using the received data; and

a component adapted to determine a read sequence to read said plurality of data records from said data storage medium to minimize time needed to read said plurality of data records.

8. The computer as claimed in claim 7, wherein said component adapted to determine a read sequence is adapted to control a data storage drive unit for moving a data storage medium past a read head; and

wherein a plurality of records recorded on said data storage medium are read in a first direction, in an order in which they are presented to the read head while the data storage medium is traveling in said first direction relative to said read head; and

wherein a second plurality of data records are read in an order in which they are presented to said read head, as said data storage medium passes said read head in a second direction relative to said read head.

9. A method of retrieving a plurality of data records from a tape data storage medium, wherein said plurality of data records are stored on a plurality of

wraps of said tape data storage medium, each wrap extending between a first end of a tape and a second end of said tape, said method comprising:

determining a number of records on each wrap;

determining a number of a target record which is to be retrieved;

determining on which of said plurality of wraps said target record resides;

determining a distance of said target record along said wrap on which said target record resides, from one of said first and second ends of said tape to obtain a physical location data of said data record; and

reading said plurality of data records by moving said tape in a first direction relative to a read head;

wherein a plurality of said data records are read consecutively along a length of said tape, without stopping movement of said tape relative to said read heads.

10. The method as claimed in claim 9, further comprising:

reversing a direction of said tape relative to said read head and reading a further plurality of said data records in a second direction, without stopping said movement of said tape relative to said read head, said second direction being opposite to said first direction.

11. The method as claimed in claim 9, further comprising:

reversing a direction of said tape relative to said read head and reading a further plurality of said data records in a second direction, without stopping said movement of said tape relative to said read head, said second direction being opposite to said first direction; and

wherein said reading a further plurality of said data records comprises moving said read head in a direction transverse to a direction of movement of said tape during a pass of said tape relative to said read head, so that said read head reads a plurality of different data tracks written to said tape.

12. A tape drive unit, comprising a transponder device adapted to read data from a cartridge memory device of a tape data storage cartridge inserted in said tape drive unit, said tape drive unit comprising:

a means for reading data from said cartridge memory device relating to a plurality of data records stored on said data storage medium; and

a means for determining a position of said data record on said data storage medium for each data record to be read; and

a means for determining an order in which to read said plurality of data records from said data storage medium to minimize time needed to read said plurality of data records.

13. A method of locating a particular wrap on which a target record is located, the method comprising:

setting a cumulative number of records equal to zero;

setting a wrap number equal to zero;

determining the number of records arranged on each wrap;

determining whether or not the number of records on a wrap is greater than a target number of file records;

if the number of records on a wrap is not greater than the target number of file records, then the particular wrap has been located; and

alternatively, if the number of records on a wrap is greater than the target number of file records, incrementing the wrap number, calculating the cumulative number of records, and determining whether or not the cumulative number of records is less than the target record;

if the cumulative number of records is less than the target record, then again incrementing the wrap number, calculating the cumulative number of records, and determining whether or not the cumulative number of records is less than the target record; and

alternatively, if the cumulative number of records is not less than the target record, then again incrementing the wrap number, then the particular wrap has been located.

14. A method of sorting a list of records to be retrieved into an optimized retrieval sequence, the method comprising:

(1) setting a current record position equal to zero;

(2) examining a list of target records and locating a final record that is closest to, but beyond a current target record in a same tape direction;

(3) determining whether or not the final record located in step (2) is available;

(4) if it has been determined in step (3) that the final record located in step (2) is available, then selecting the next record;

(5) repositioning read head to new record position along tape in same tape direction, taking into account settling distance for switching wraps;

(6) reading record;

(7) returning to step (1);

(8) if it has been determined in step (3) that the final record located in step (2) is not available, then examining the list of target records and locating a record that is closest to an end of tape or beginning of tape to which reading of records is currently progressing;

(9) determining whether or not the record located in step (8) is available;

(10) if the record located in step (8) is available, then repositioning read head to beyond the new record position along tape in same tape direction and then reversing the tape direction;

(11) returning to step (1);

(12) if the record located in step (8) is not available, then determining whether or not all records have been retrieved;

(13) if it has been determined in step (12) that all records have been retrieved, then stopping process; and

(14) if it has been determined in step (12) that all records have not been retrieved, then returning to step (1).